

FIG.1A
(PRIOR ART)

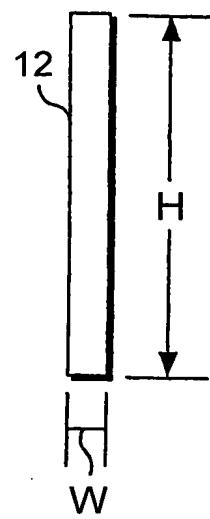


FIG.1B
(PRIOR ART)

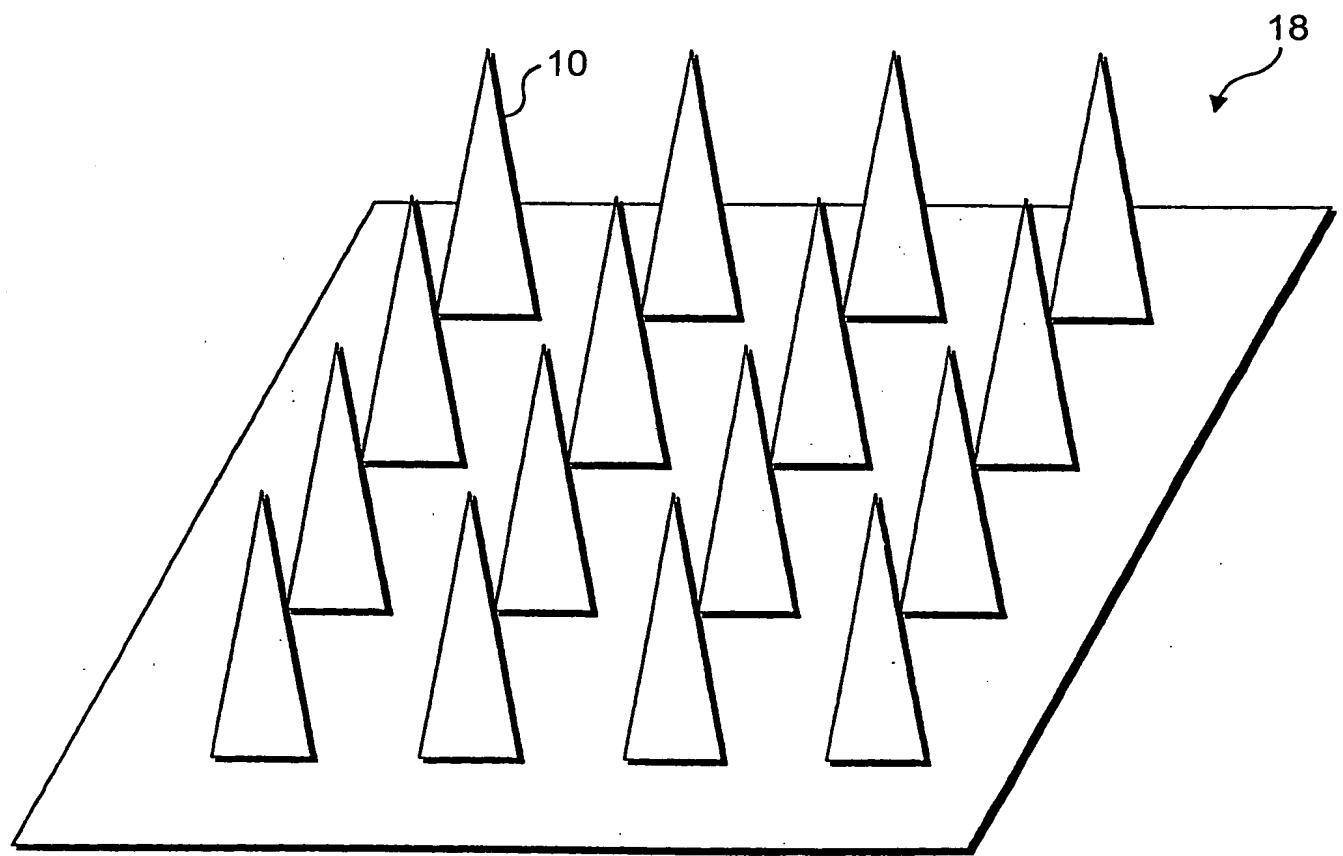


FIG.2
(PRIOR ART)

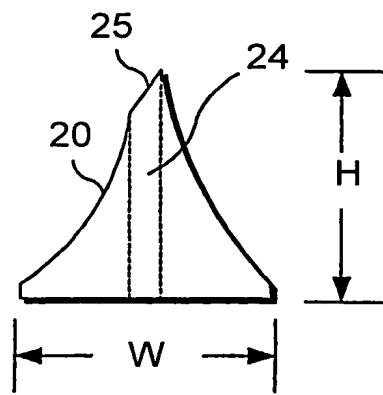


FIG.3A

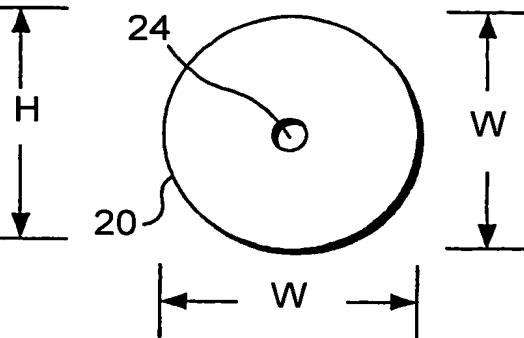


FIG.3B

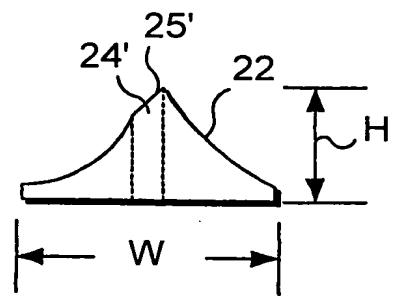


FIG.4

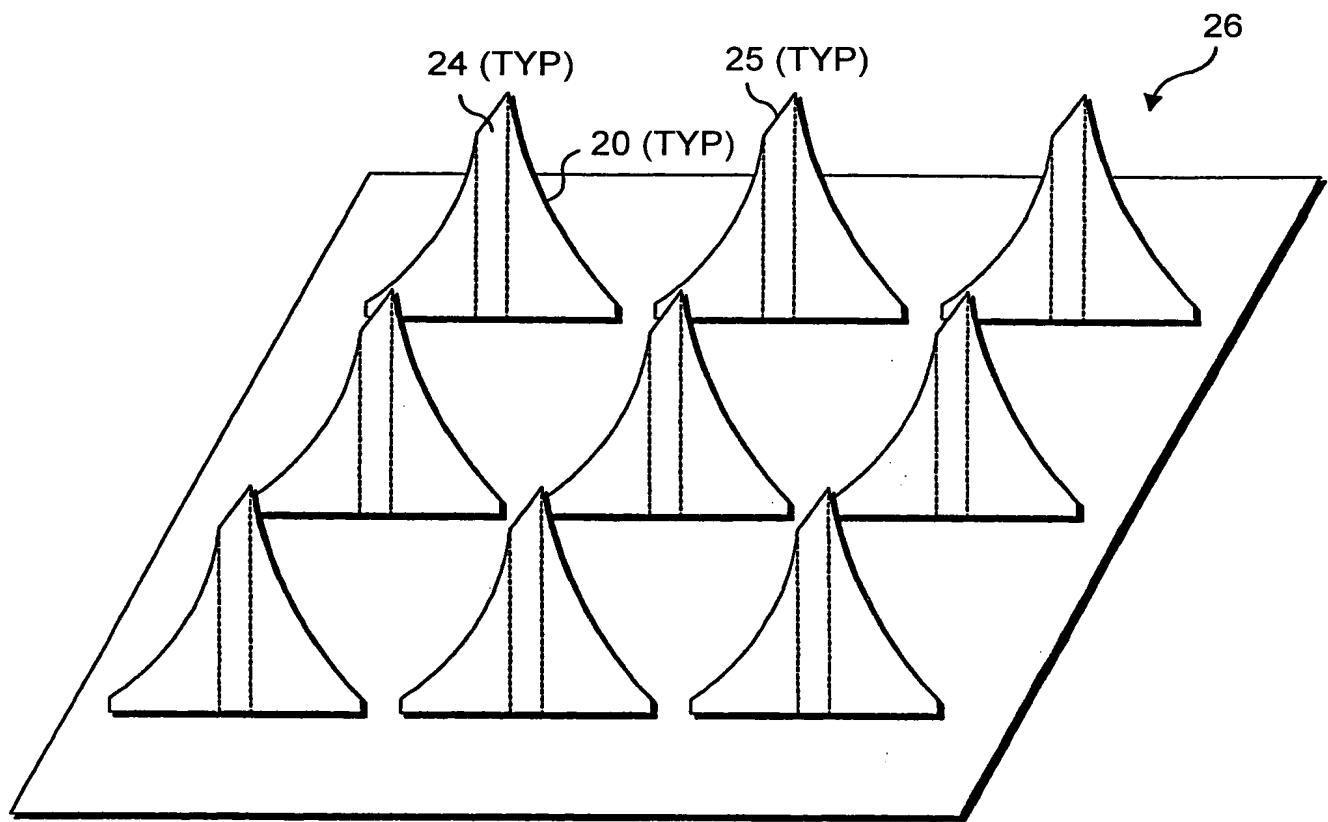


FIG.5

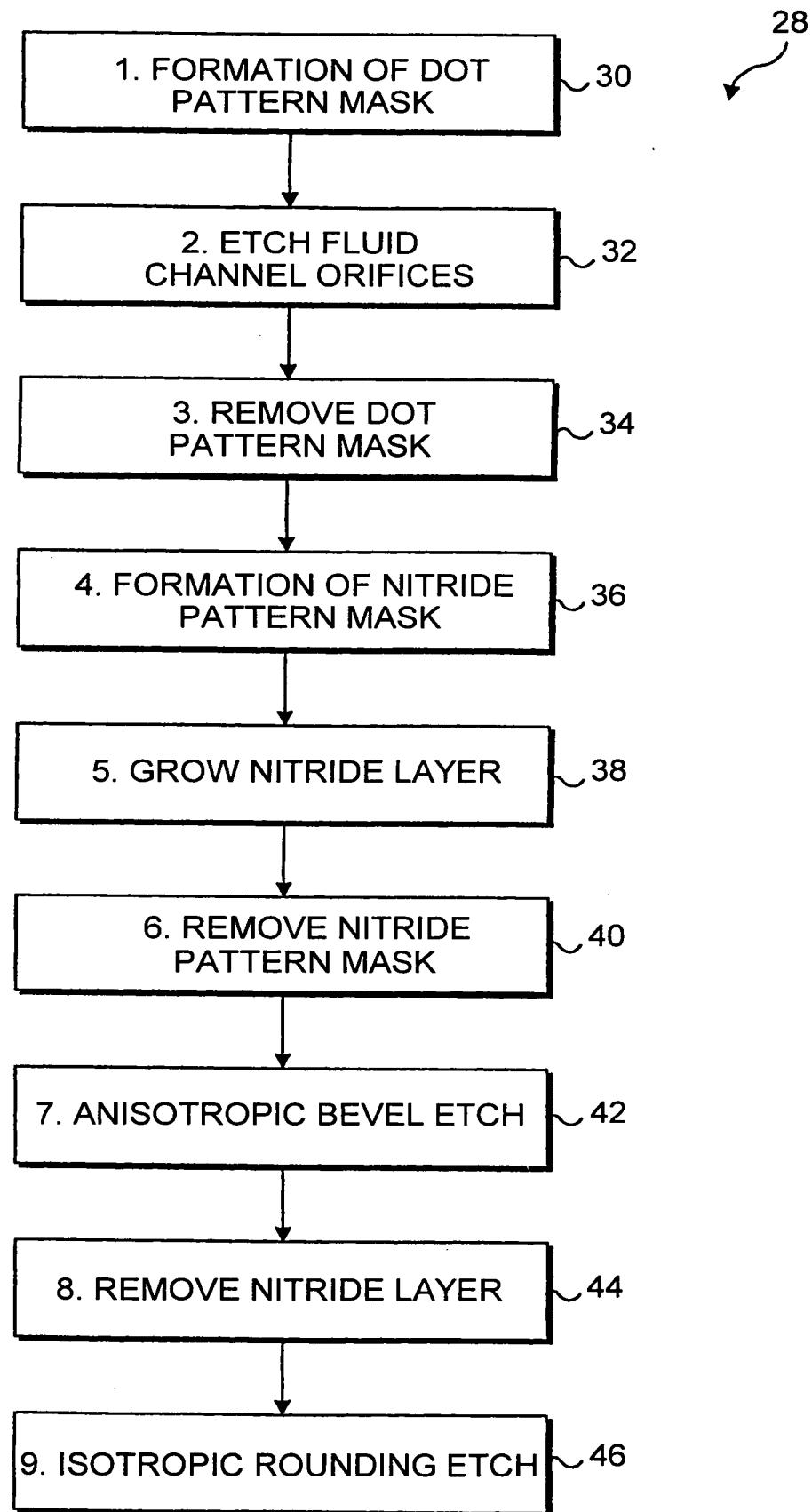


FIG.6

STEP 1. FORM DOT
PATTERN MASK

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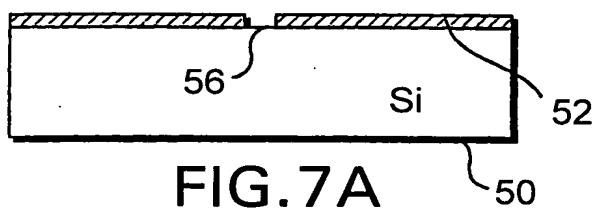


FIG. 7A

STEP 3. REMOVE DOT
PATTERN MASK

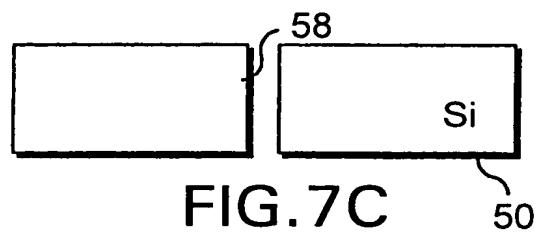


FIG. 7C

STEP 2. ETCH ORIFICE
THROUGH SUBSTRATE

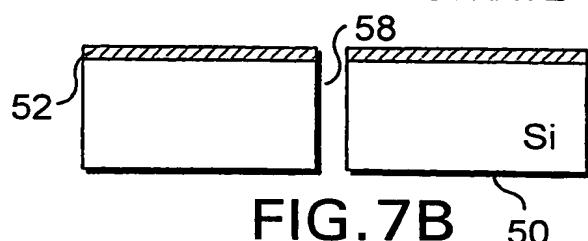


FIG. 7B

STEP 4. FORM NITRIDE
PATTERN MASK

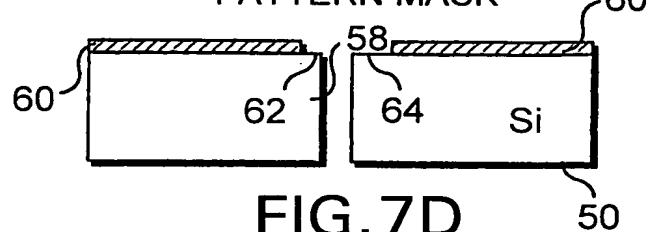


FIG. 7D

STEP 5. GROW NITRIDE LAYER

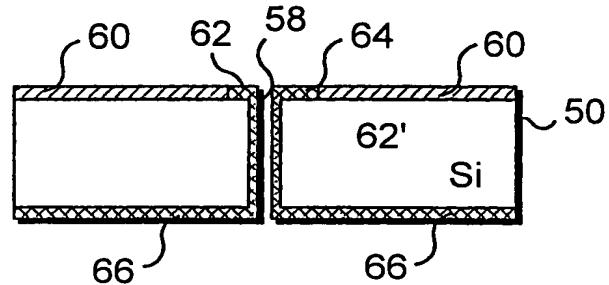


FIG. 7E

STEP 6. REMOVE NITRIDE
PATTERN MASK

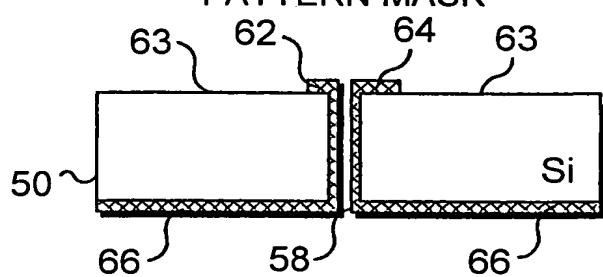


FIG. 7F

STEP 7. ANISOTROPIC ETCH

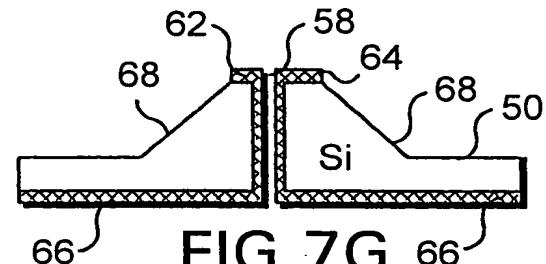


FIG. 7G

STEP 8. REMOVE NITRIDE LAYER

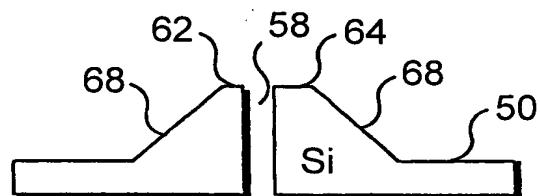


FIG. 7H

STEP 8. ISOTROPIC ETCH

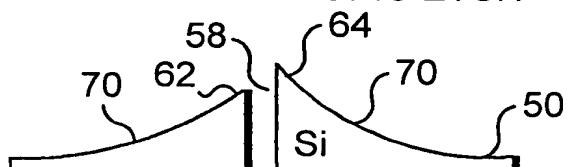


FIG. 7I

FINISHED MICRO-NEEDLE

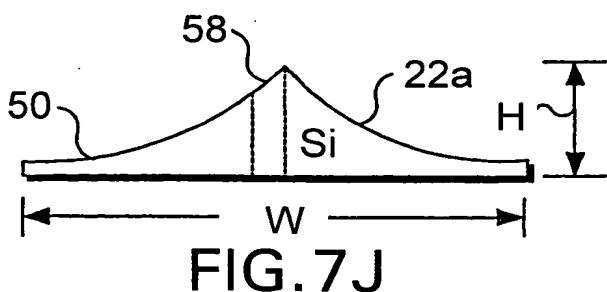


FIG. 7J

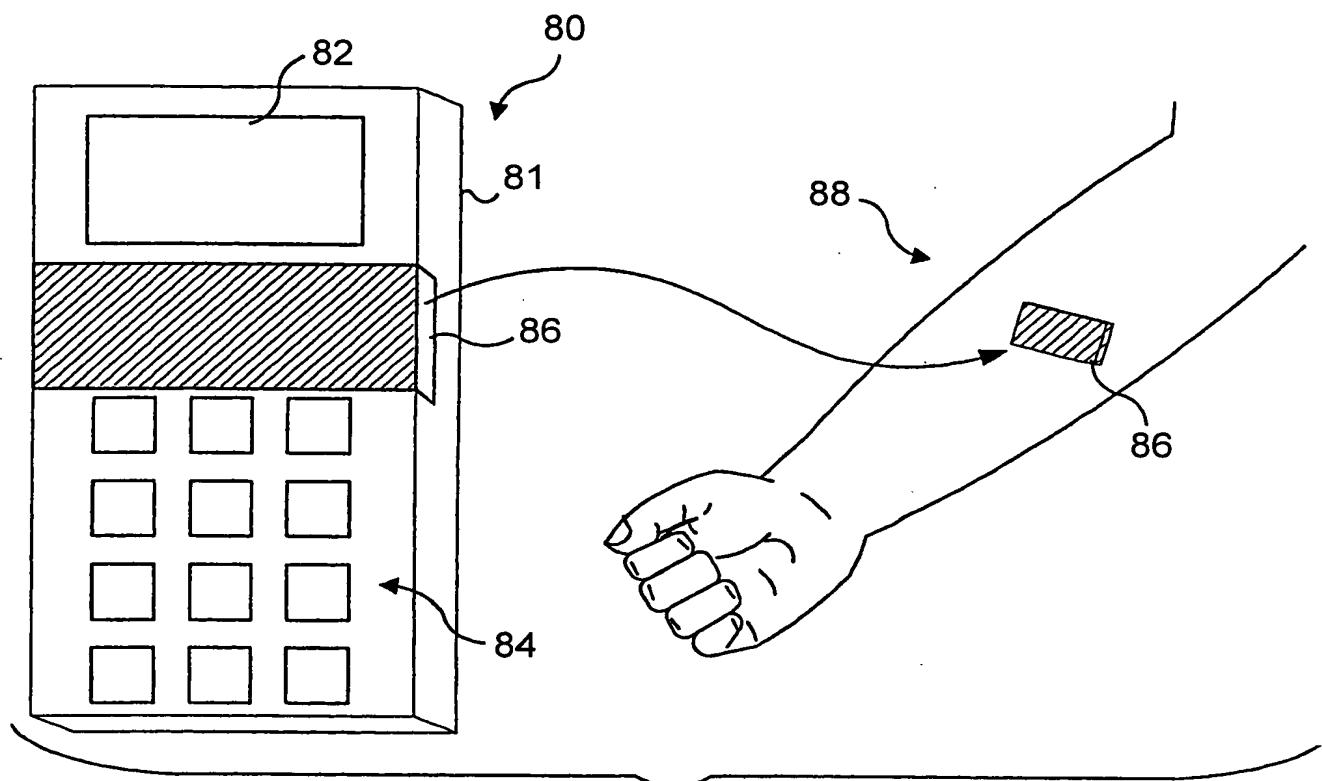


FIG. 8

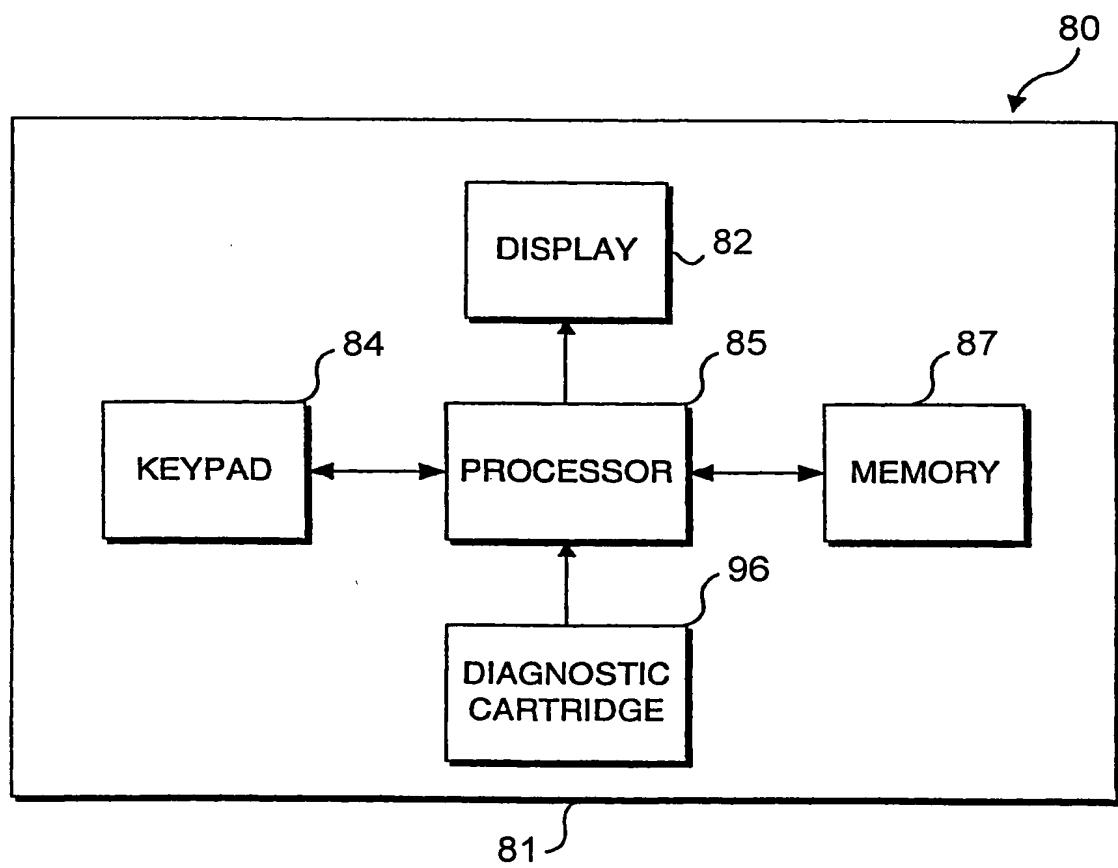
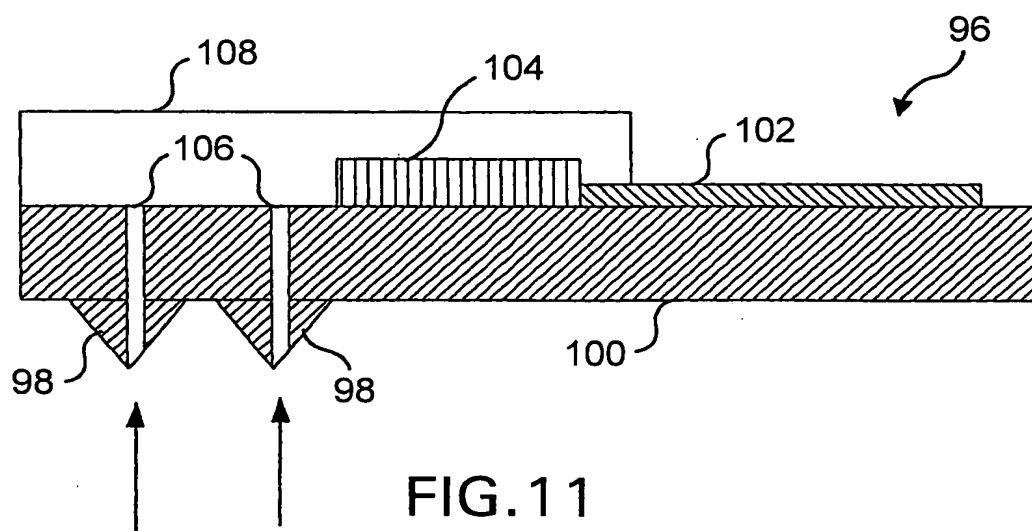
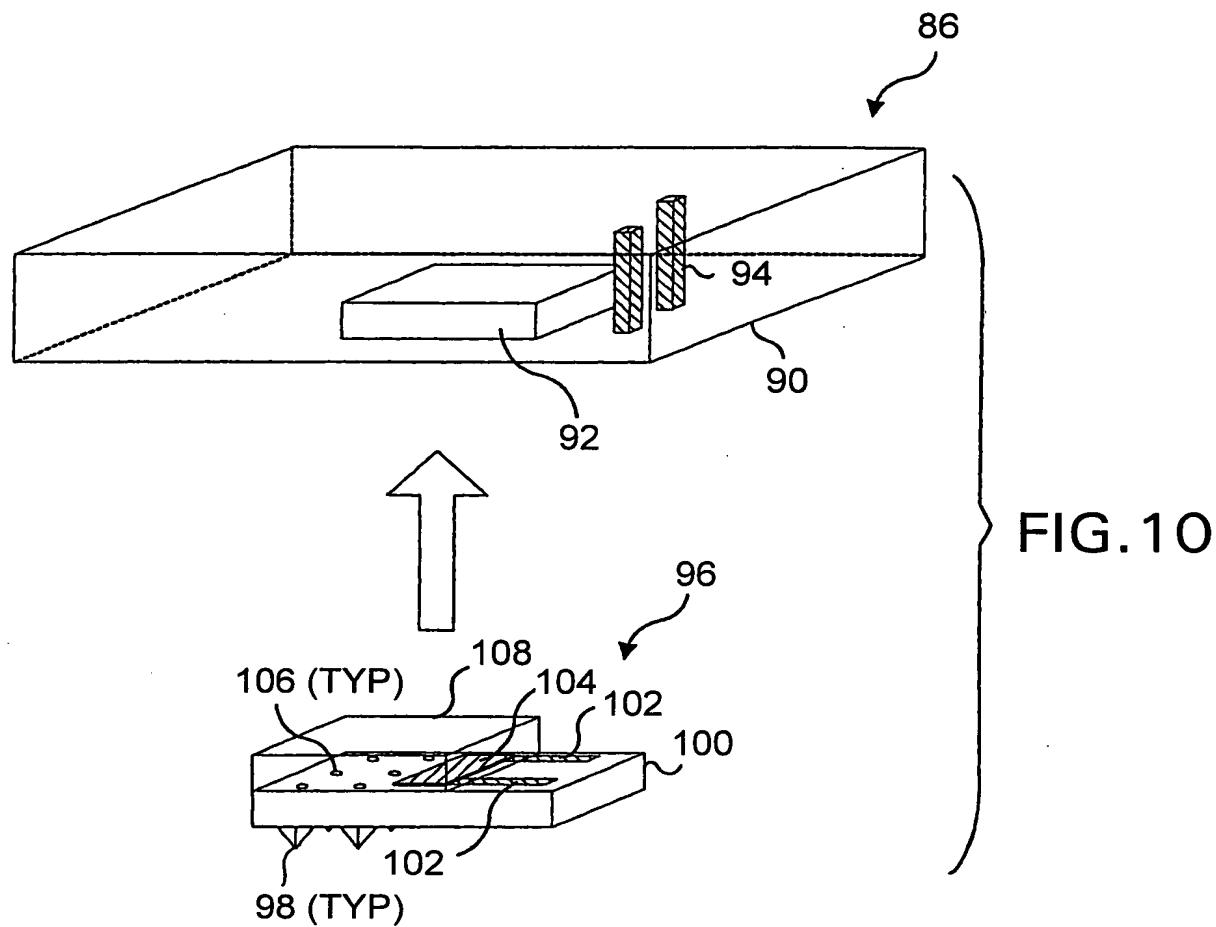


FIG. 9



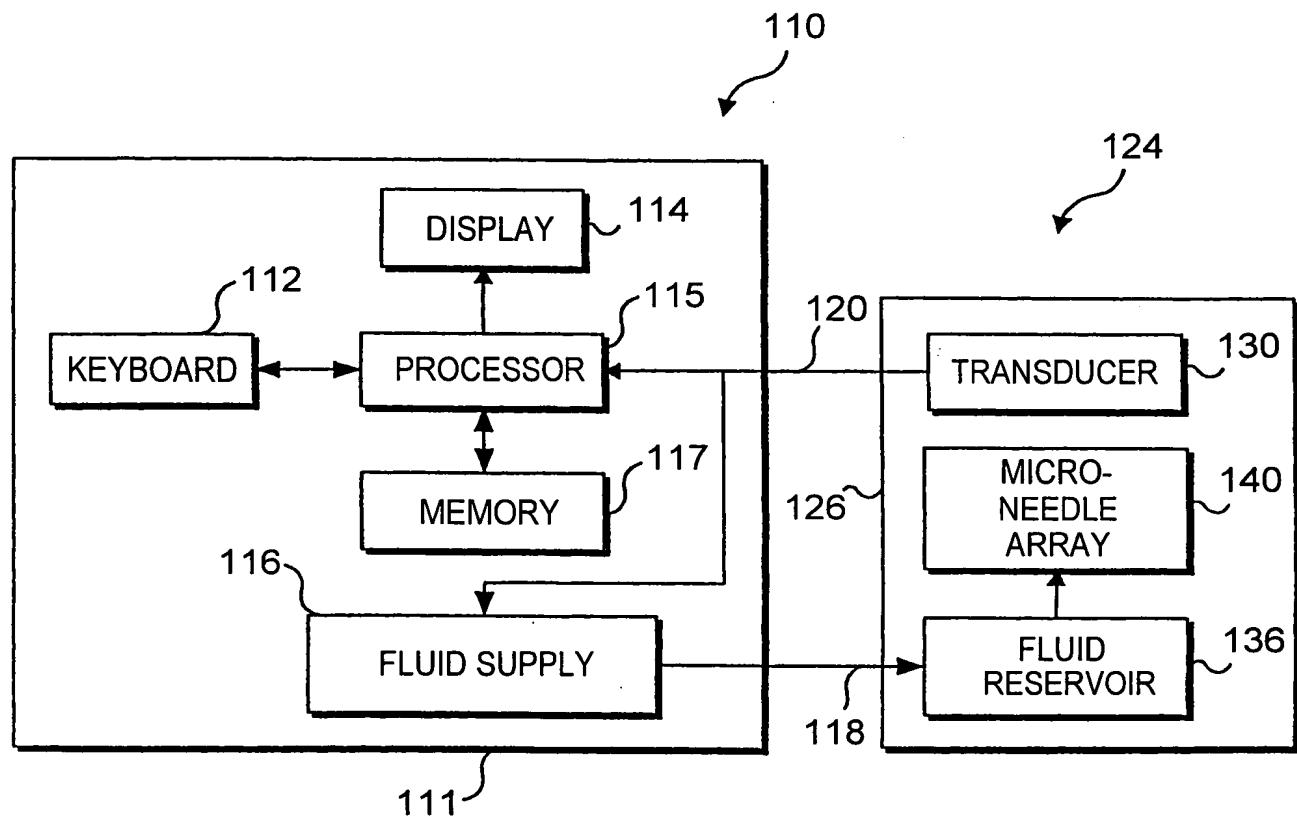
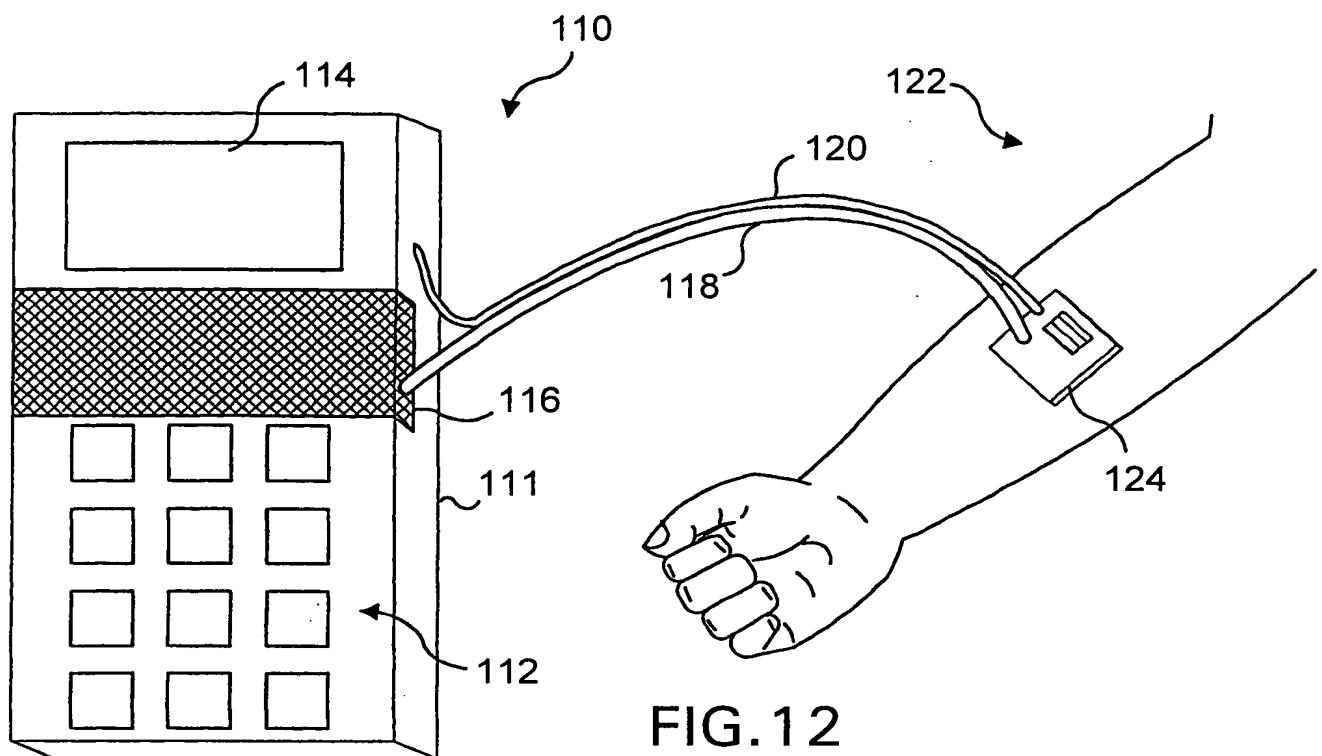


FIG. 13

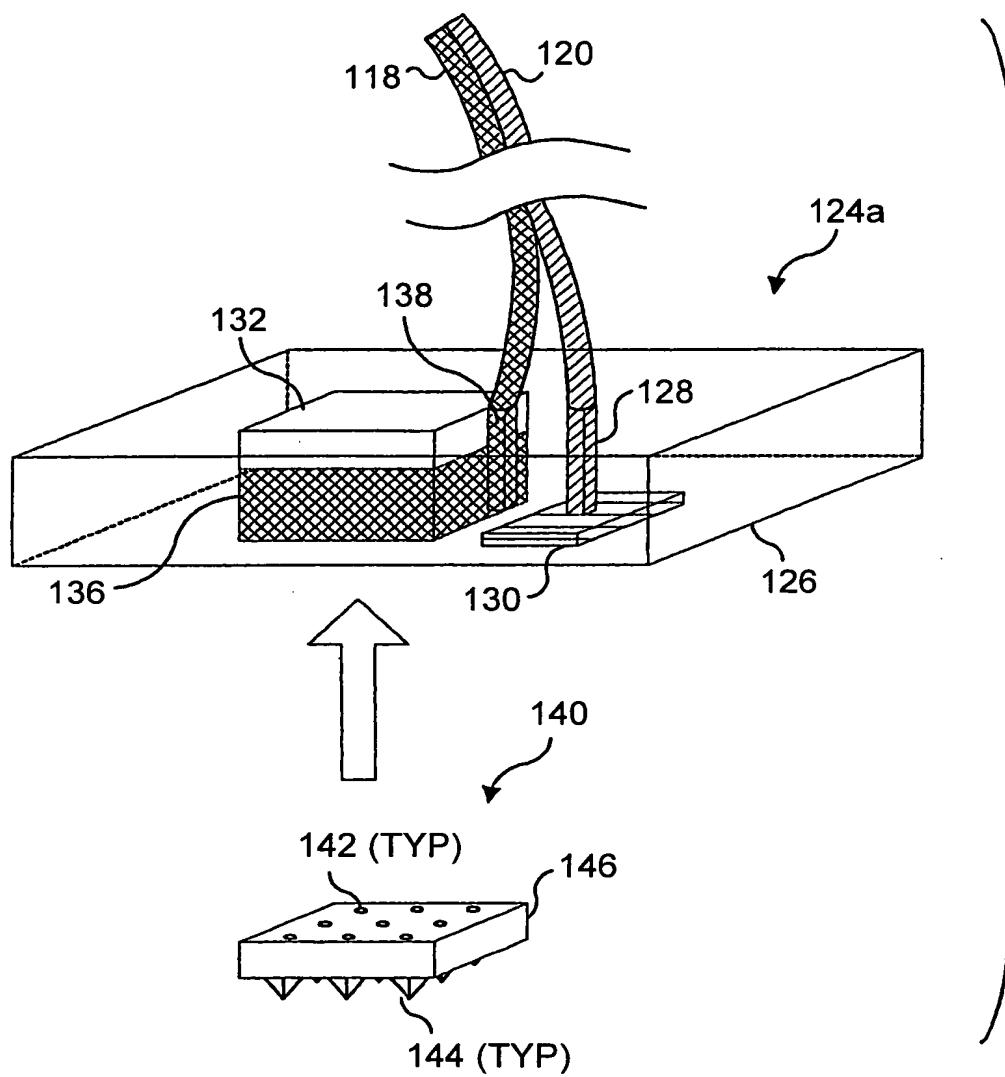


FIG. 14

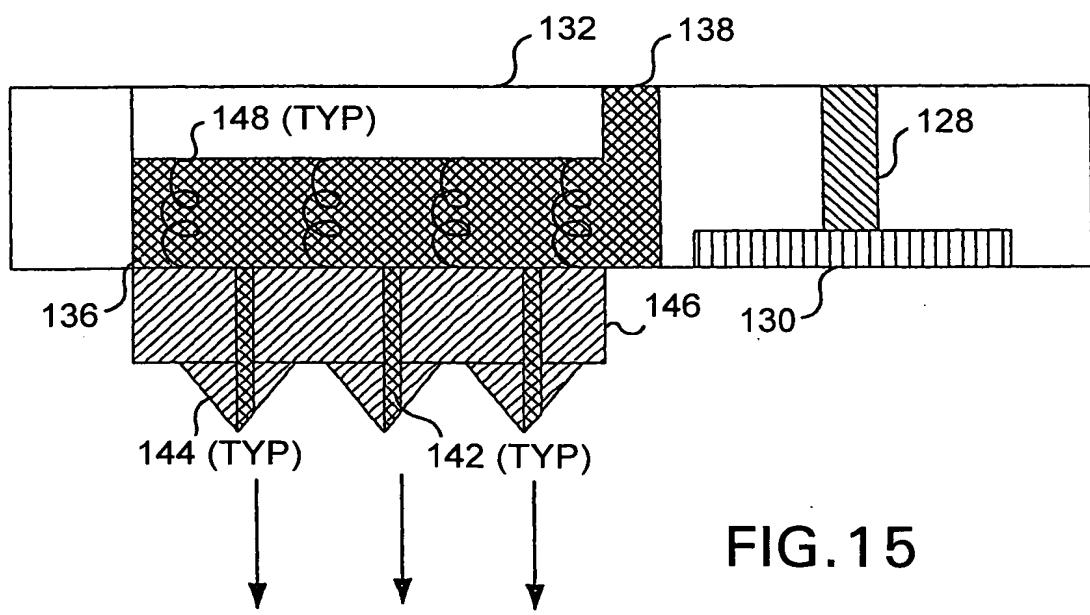


FIG. 15

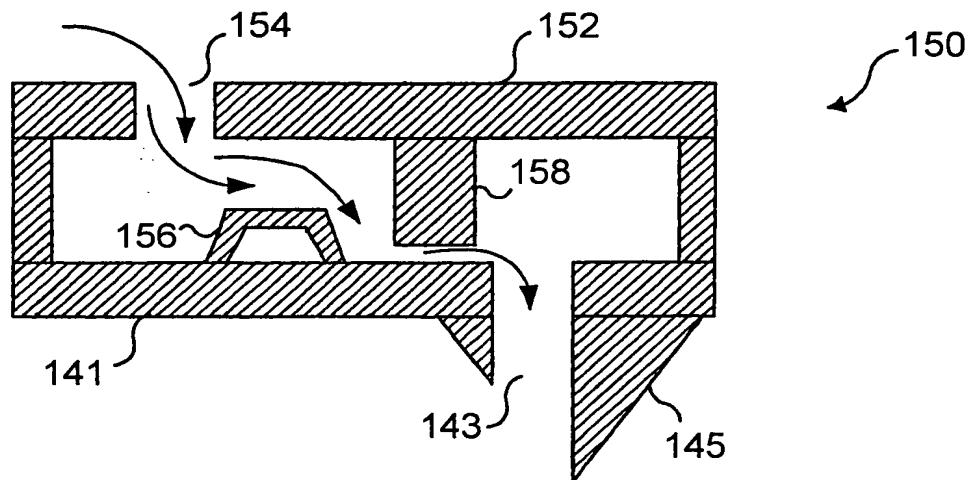


FIG. 16

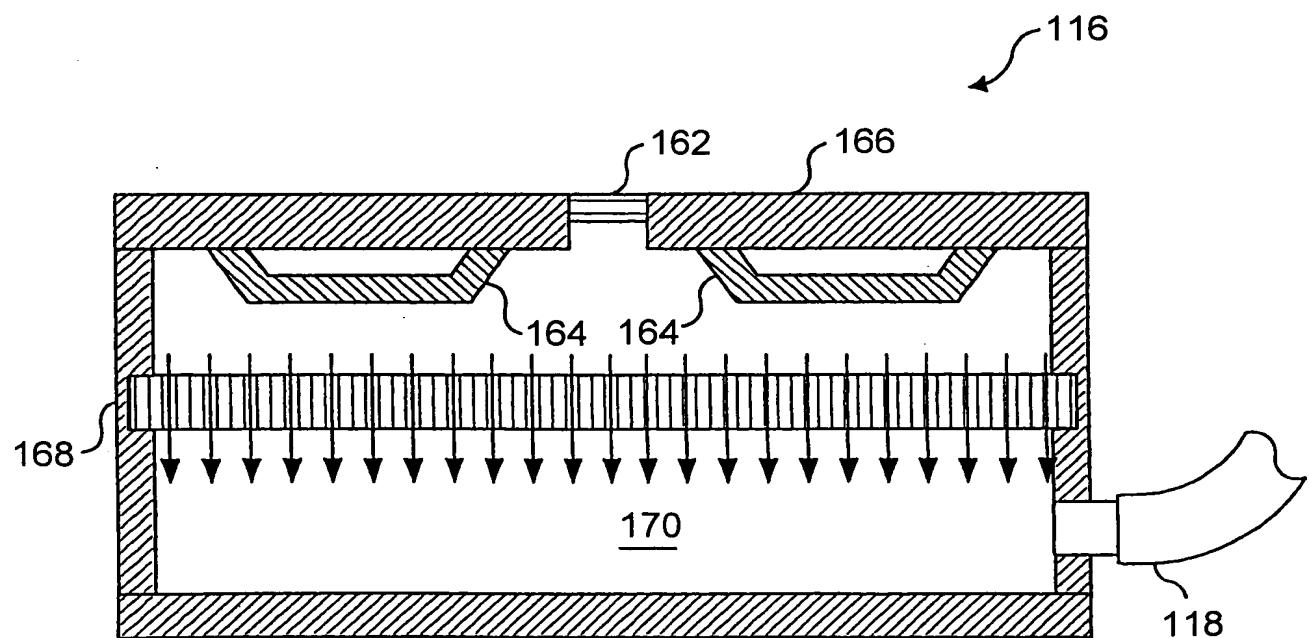


FIG. 17